

REMARKS/ARGUMENTS

1. Applicants respectfully request reconsideration of the claims in view of the above amendments and the following remarks/arguments.
2. As discussed in the subject patent application, anode-supported solid oxide fuel cells of the type claimed herein (i.e., having a thick, supporting anode onto which an electrolyte and a cathode are formed) are not merely inside-out versions of cathode-supported solid oxide fuel cells of the type described in Ruka '713. The materials and processes used to produce the claimed anode-supported solid oxide fuel cells are different than the materials and processes used to produce cathode-supported solid oxide fuel cells, and the anode-supported solid oxide fuel cells are physically different than the cathode-supported solid oxide fuel cells in terms of such things as cost and performance (both electrical and mechanical). Thus, the teachings of Ruka '713 relating to a cathode-supported solid oxide fuel cell having a sintered anode do not provide a roadmap for producing an anode-supported solid oxide fuel cell having a sintered support anode as claimed.

Focusing just on the sintered anodes themselves, it should be clear that the claimed anode is quite different than Ruka's anode. For one thing, the claimed anode is relatively thick in order to mechanically support the fuel cell as the electrolyte and cathode layers are added, whereas Ruka's anode is intentionally thin and is deposited onto the electrolyte using a slurry. It would seem to be very difficult, if not impossible, to form a working anode from scratch using Ruka's slurry-based process such that the resulting anode would be capable of supporting the fuel cell as an electrolyte layer and a cathode layer are added. Furthermore, the claimed anode includes an electrochemically active metallic

substance that is predominantly reduced metal oxide, whereas Ruka's anode includes an electrochemically active metallic substance that is predominantly metal with optionally some reduced metal oxide. As a result, Ruka's anode will generally contain a larger proportion of electrochemically active metallic substance (e.g., 70 to 80 weight percent sintered dendritic nickel) compared to the claimed anode (e.g., 40 to 50 volume percent nickel). Additionally, because Ruka's anode is a thin layer with a relatively high electrical resistance, Ruka optionally adds a sintering aid (e.g., TiO₂) to improve sintering and increase the electrical conductivity of the resulting anode. For at least these reasons, Applicants respectfully submit Ruka '713 neither teaches nor suggests fuel cell anodes and related fuel cells of the types claimed herein.

Song's anode includes carbon powder as a distinct pore forming agent. In fact, Song uses at least 20 vol % carbon powder (otherwise the fuel electrode will be too low in porosity to operate normally as an electrode) but no more than 50 vol % carbon powder (otherwise the fuel electrode becomes poor in strength) as a distinct pore forming agent. See Song, Col. 3, lines 35-45. As Song points out, however, incomplete combustion of the carbon powder can result in reduced porosity (and efficiency) of the fuel electrode, and therefore Song preferably uses 30 vol % carbon powder in an extrusion process in order to obtain sufficient porosity and strength. See Song, Col. 6, lines 43-57. As discussed in the subject patent application beginning at page 13, line 21, addition of a pore-forming substance such as carbon powder also creates a risk of changing the size of the tube when the pores form and of creating cracks in the electrolyte layer. Applicants respectfully submit that Song neither teaches nor suggests fuel cell anodes and related fuel cells of the types claimed herein.

Independent claim 32 has been amended to clarify that the tubular anode comprises an electrochemically active metallic substance consisting essentially of reduced metal oxide such as reduced NiO without a distinct pore forming agent.

Thus, the presently claimed invention includes a porous tubular support anode that lacks a distinct pore forming agent such as carbon powder and instead has pores formed by reducing an oxide of an electrochemically active substances, such as nickel oxide. Because the anode of the claimed invention is formed from a material that lacks carbon powder or other distinct pore-forming agent, the resulting anode will lack any residual carbon powder and therefore the issues discussed above in conjunction with use of a distinct pore-forming agent will be avoided.

Claims 1-13, 16, 18, 27-31, and 87 have been re-written as new claims 92-111, mainly to remove some improper claim dependencies that resulted from earlier amendments. New claims 92, 95, 98, and 107 contain some minor amendments, mainly for consistency. Claim 39 has been amended to allow for a wider range of anode thicknesses.

3. All pending claims are believed to be in a form suitable for allowance. Therefore, the application is believed to be in a condition for allowance. The Applicants respectfully request early allowance of the application.

4. Applicants hereby request a follow-on telephone conference with the Examiner and request that the Examiner contact the undersigned, Jeffrey T. Klayman, to coordinate further prosecution.

5. Applicants do not believe any extension of time is required for timely consideration of this response. In the event that an extension has been overlooked, this conditional petition of extension is hereby submitted. Applicants request that deposit account number 19-4972 be charged for any fees that may be required for the timely consideration of this application.

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Respectfully submitted,

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